

same as 1885; Grand Haven, Mich., 81, 1 above 1883; Marquette, Mich., 87, 5 above 1887; Duluth, Minn., 81, 1 above 1887; Saint Vincent, Minn., 90, 6 above 1887; Moorhead, Minn., 91, 5 above 1887; Bismarck, N. Dak., 90, 3 above 1887; Fort Sully, S. Dak., 93, the same as 1874; Valentine, Nebr., 89, the same as 1887; Omaha, Nebr., 90, 1 above 1880; Fort Stanton, N. Mex., 78, the same as 1887; Fort Custer, Mont., 86, 2 above 1881; Fort Assiniboine, Mont., 84, 3 above 2 or more years; Helena, Mont., 82, 4 above 2 or more years; and Port Angeles, Wash., 67, the same as 1885.

The reports of United States Army post surgeons and voluntary observers show the following maximum temperatures in states and territories where temperature rising to or above 90 was reported for April, 1891: Volcano Springs, Cal., 112; Maricopa, Ariz., 108; Oelrichs, S. Dak., 102; Eureka Ranch, Kans., 101; Beaver City and Lexington, Nebr., 100; Moab, Utah, 97; Camp Del Rio and Fort Hancock, Tex., Denison, Iowa, and Glendive, Mont., 96; Portsmouth (2), Ohio, 95; Richmond, Va., and Archer, Fla., 94; Lead Hill, Ark., and Vaiden, Miss., 93; Winnsborough, S. C., Wiggins, Ala., several stations in Colorado, Louisville, Ga., Frankfort (2), Ky., and Kinbrae, Minn., 92; Harriman, Tenn., 91; several stations in N. Dak., Guthrie, Okla. T., Flora, Ill., Huntingburgh, Ind., Fort Supply, Ind. T., and Liberty Hill, La., 90.

The lowest temperature reported by a regular station of the Signal Service was 6, at Saint Vincent, Minn., Fort Washakie, Wyo., and Denver, Colo. The minimum temperature was below 10 in extreme north New England, in extreme east upper Michigan, and from North Dakota southwestward over central Wyoming and thence southeast over central Colorado. The minimum temperature was below 20 north of a line traced from east-central Maine west-southwest to south New Mexico, thence northwestward to northwest Nevada, and thence east of north to west Montana. At the following-named stations of the Signal Service the minimum temperature was as low or lower than previously reported for April: Charlotte, N. C., 26, 2 below 1881; Jacksonville, Fla., 34, 3 below 1881; Key West, Fla., 54, 7 below 2 or more years; Pensacola, Fla., 34, the same as 1881; Mobile, Ala., 32, the same as 1881; Palestine, Tex., 36, the same as 1886; Fort Smith, Ark., 28, 2 below 1887; Montrose, Colo., 17, 1 below 1886; San Francisco, Cal., 40, the same as 1875; Port Angeles, Wash., 27, 1 below 1890.

The reports of United States Army post surgeons and voluntary observers shows the following minimum temperatures in states and territories where temperature falling to or below 20 was reported for April, 1891: Breckenridge, Colo., -35; Henry's Lake, Idaho, -14; Chama, N. Mex., -11; Hayward, Wis., -5; Leech Lake and Pine River, Minn., and Gallatin, N. Dak., 0; Gaylord, Mich., 1; West Milan, N. H., 2; Fort D. A. Russell, Wyo., 4; Ely, Nev., 5; Fort Niobrara, Nebr., and Jacksonville, Vt., 6; Orangeville, Ohio, and Webster, S. Dak., 7; Keene Valley, N. Y., and Beaver, Utah, 8; Martinsdale, Mont., 9; Point Isabel, Ind., Greenville, Pa., and Lapush, Wash., 11; Boca, Cal., Farmington, Me., and Monson, Mass., 12; Eureka Ranch, Kans., 13; Larrabee, Iowa, Beulah and Joseph, Oregon, and Tannery, W. Va., 14; Canton, Conn., Adrian, Mo., and Marion, Va., 15; Aurora (1), Ill., and Fort Supply, Ind. T., 17; Cooley's, Ariz., several stations in N. J., Franklin, N. C., and Kingston (2), R. I., 20.

#### LIMITS OF FREEZING WEATHER.

The southern limit of freezing weather is shown on Chart IV by a line traced from the Virginia coast, southwest to extreme south Alabama, thence west of north to west Tennessee, thence south of west to south New Mexico, and thence north of west to extreme south Nevada, and the western limit of freezing weather is shown by this line continued northward over east California to southwest Oregon, thence northeast over the valley of the Columbia River, and thence northwestward to extreme northwest Washington.

#### RANGES OF TEMPERATURE.

The greatest and least daily ranges of temperature are given in the table of Signal Service data. The greatest monthly ranges of temperature occurred in North Dakota and northwest Minnesota, where they exceeded 80, whence they decreased eastward to less than 40 on the New England coast, southeast to less than 30 over extreme south Florida, southward to less than 40 on the west Gulf coast, southwest to less than 40 on the middle and south Pacific coasts, and west to less than 30 on the north Pacific coast.

#### FROST.

Killing frost was generally reported in the Gulf and south Atlantic states, and in Florida as far south as Jupiter Inlet and Lee county, from the 3d to 7th. In Florida vines, fruits, and vegetables were injured. At Tampa, Fla., the heavy frost of the 7th was reported the first ever observed in that locality. The observer reports, however, that frost probably occurred in that section in April, 1857, when the temperature fell to 26 at Tampa, to 32 at Fort Myers, to 30 at Fort Pierce, on Indian River, and at Fort Dallas. There is positive evidence of frost and ice on December 25th and 26th, 1856, and January 20th, 1857, at Fort Dallas, Fla., which is below the 26th parallel, and Assistant Surgeon R. F. Simpson, U. S. Army, reported that in April, 1857, frost and ice occurred at that place, and that on the morning of January 20th, 1857, the thermometer was 30. At Jupiter, Fla., the killing frost of the 7th seriously injured fruit and vegetables. At De Land, Fla., the new tender growth of evergreen trees was injured. In Georgia fruit was injured and vines and vegetables killed. In the Carolinas fruit was injured and tender plants and early vegetables damaged. In Alabama young buds were nipped and delicate vegetation destroyed. In Mississippi and Louisiana fruit and early vegetables were considerably injured. At Memphis, Tenn., killing frost damaged peaches on the 4th. On the 21st the peach crop at Barren Creek Springs, Md., was damaged. On the 25th light frost injured tender plants and grapevines at Walla Walla, Wash. On the 26th frost damaged young crops and grapevines at Egg Harbor City, N. J. On the 29th frost injured garden vegetables at Philo, Ill., and killed asparagus plants at Dyberry, Pa.

Compared with the preceding month the southern limit of frost for April, 1891, was about 3° farther south in Florida. In Texas the southern limit was about the same. In Arizona the southern limit in April was about 1° farther north, and in California the southern limit was about the same.

The killing frost on the 5th to 7th in Florida was about 2 months late, and that of the 3d to 7th in the Gulf States was about 1 month late, when compared with the average date of last killing frost in the respective localities.

#### PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada for April, 1891, as determined from the reports of nearly 2,000 stations, is exhibited on Chart III. In the table of Signal Service data the total precipitation and the departure from the normal are given for each Signal Service station. The figures opposite the names of the geographical districts in the columns for precipitation and departure from the normal

show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the precipitation is below the normal and subtracting when above.

The heaviest monthly precipitation reported was 13.84, at Gallinas, Tex.; 13.74 fell at Huntsville, Tex.; 11.84 at Neah Bay, Wash.; 11.35 at Bandon, Oregon; and 11.22 at Upper Mattole, Cal. The precipitation exceeded 8.00 generally along

the immediate Pacific coast north of the 40th parallel, and in areas in east Texas. No rainfall was reported in extreme southeast California, and in an area extending from southeast Arizona to extreme west Texas, and less than 1.00 was reported over the northern plateau and thence northeast to Manitoba, in California south of the San Joaquin Valley, over the greater part of the southern plateau, east Utah, and west Colorado, on the Louisiana coast, in the extreme north part of the upper lake region, in east-central Georgia, and at Hatteras, N. C.

The monthly precipitation was above the normal on the north Pacific coast, at San Francisco, Cal., from east Montana and the Dakotas southward to east Texas, at the more northern stations in the Lake region, in the middle Saint Lawrence valley, generally in Nova Scotia, and at Lynchburgh, Va.; elsewhere the precipitation was below the normal. The greatest departure above the normal precipitation was noted on the extreme north Pacific coast, where it exceeded 4.00, and there was an excess of more than 2.00 along the Washington coast, from south-central Indian Territory over east-central Texas, and at Parry Sound, Ont. The most marked departure below the normal precipitation was reported at Hatteras, N. C., where it was more than 4.00, and the deficiency was more than 2.00 from the middle coast of the Gulf of Mexico northward to Kentucky.

Considered by districts the average percentage of the normal in districts where the precipitation was in excess was about as follows: Rio Grande Valley, 209 per cent.; north Pacific coast, 159 per cent.; extreme northwest, 139 per cent.; and northeast slope of the Rocky Mountains, 113 per cent. In districts where the precipitation was deficient the percentage of the normal was about as follows: southern plateau, 11 per cent.; east Gulf states, 34 per cent.; south Atlantic states, 44 per cent.; Ohio Valley and Tennessee, 53 per cent.; northern plateau, 57 per cent.; Key West, Fla., 62 per cent.; middle plateau, 62 per cent.; south Pacific coast, 64 per cent.; New England and middle Atlantic states, 68 per cent.; lower lake region, 76 per cent.; Missouri Valley, 87 per cent.; upper Mississippi valley and southeast slope of the Rocky Mountains, 88 per cent.; middle Pacific coast, 93 per cent.; west Gulf states, 96 per cent.; upper lake region and middle-eastern slope of the Rocky Mountains, 97 per cent.

At the following-named stations the precipitation for the current month was the heaviest ever reported for April: Palestine, Tex., 8.95, 4.64 greater than the normal, and 1.65 greater than in 1884; Lawrence, Kans., 5.79, 2.59 greater than the normal, and 0.07 greater than in 1885; Fort Canby, Wash., 7.80, 3.92 greater than the normal, and 1.42 greater than in 1887; Port Angeles, Wash., 3.03, 0.63 greater than the normal, and 0.36 greater than in 1886; Neah Bay, Wash., 11.84, 6.72 greater than the normal, and 4.05 greater than in 1888; Tatoosh Island, Wash., 9.62, 4.59 greater than the normal, and 1.11 greater than in 1887. The greatest precipitation reported for April occurred in Maryland, District of Columbia, and east Virginia in 1889, when the precipitation was 5.00 to 8.00 in excess of the normal; over the west part of the middle plateau in 1887, when the excess was about 1.00; over the east part of the middle and northern plateau regions in 1886, when the excess was 1.00 to 2.00; on the Maine coast in 1884, when the excess was about 3.00; in the interior of the south Atlantic states in 1883, when the excess was 2.00 to 4.00; on the middle and south Pacific coasts, over the west part of the lower lake region, and in Ohio in 1880, when the excess was 3.00 to 10.00 in California, and 2.00 to 4.00 in Ohio and at Lake Erie stations; on the immediate south Atlantic coast in 1877, when the excess was 3.00 to 11.00; and in areas from New England southwest to the lower Mississippi valley in 1874, when the excess was 4.00 to 7.00 in New England and the north part of the middle Atlantic states, 5.00 to 12.00 in Tennessee, and 5.00 to 15.00 in north Louisiana and Mississippi.

At the following-named stations the precipitation for the current month was the least ever reported for April: Wellsborough, Pa., 1.07, 3.99 deficient, and 0.47 less than in 1881; Cleveland, Ohio, 1.52, 0.83 deficient, and 0.23 less than in 2 or

more years; Nashville, Tenn., 2.24, 2.70 deficient, and 0.12 less than in 1886; New Orleans, La., 0.26, 5.12 deficient, and 1.25 less than in 1878; Grand Coteau, La., 0.87, 4.18 deficient, and 0.90 less than in 1887; El Paso, Tex., 0.00, 0.20 deficient, and no rain fell in 1882; Fort Stanton, N. Mex., 0.02, 0.65 deficient, and 0.02 less than in 1887; Yuma, Ariz., 0.00, 0.09 deficient, and no rain fell in 4 preceding years; and Keeler, Cal., 0.10, 0.50 deficient, the same as 1890. The least rainfall ever reported for April on the middle and south Pacific coasts occurred in 1888, when the deficiency was 2.00 to 3.00; in the west Gulf states in 1887, when the deficiency was 3.00 to 5.00; on the north Pacific coast in 1885, when the deficiency was 2.00 to 5.00; and from northeast New Mexico to Nebraska in 1880, when the deficiency was 0.50 to 2.75.

In 1887, when the precipitation was the heaviest reported for April over the west part of the middle plateau, it was the least ever reported for that month in the west Gulf states. In 1880, when the precipitation was the heaviest reported for April on the middle and south Pacific coasts and at Lake Erie and Ohio stations, it was the least ever reported for April from northeast New Mexico to Nebraska.

The precipitation, January to April, 1891, inclusive, averaged about as follows: in New England, the east and west Gulf states, the Lake region, the upper Mississippi valley, over the middle plateau, and on the middle and south Pacific coasts, the precipitation about equaled the average. On the northeast and middle-eastern slopes of the Rocky Mountains the precipitation was about one-half greater than usual; in the middle Atlantic states, the Rio Grande Valley, and the extreme northwest it was about one-fourth greater than usual; and in the Ohio and Missouri Valleys, on the southeast slope of the Rocky Mountains, and over the south plateau, it was one-tenth to two tenths greater than usual. Over the north plateau about three-fourths of the usual amount of precipitation was reported, and on the south Atlantic coast, at Key West, Fla., and on the north Pacific coast, the deficiency was small.

#### DEVIATIONS FROM AVERAGE PRECIPITATION.

The following table shows for certain stations, as reported by voluntary observers, (1) the average precipitation for April for a series of years; (2) the length of record during which the observations have been taken and from which the average has been computed; (3) the total precipitation for April, 1891; (4) the departure of the current month from the average; (5) and the extremes for April during the period of observation and the years of occurrence:

State and station.	County.	(1) Average for the month of April.	(2) Length of record.	(3) Total for April, 1891.	(4) Departure from average.	(5) Extremes for April.			
						Greatest.		Least.	
						Am't.	Year.	Am't.	Year.
Arkansas.		Inches	Years	Inches	Inches.	Inches.		Inches	
Lead Hill.....	Boone.....	4.15	9	3.71	-0.44	6.61	1882	1.57	1889
California.									
Sacramento.....	Sacramento.....	1.86	41	1.75	-0.11	14.20	1880	T.	1875
Connecticut.									
Middletown.....	Middlesex.....	3.33	29	3.90	+0.57	7.16	1874	1.48	1882
Florida.									
Merritt's Island.....	Brevard.....	4.00	13	7.50	+3.50	9.74	1878	0.53	1885
Georgia.									
Forsyth.....	Monroe.....	4.19	17	1.45	-2.74	9.59	1883	0.55	1888
Illinois.									
Peoria.....	Peoria.....	3.05	35	3.64	+0.59	6.25	1858	0.45	1870
Riley.....	McHenry.....	2.92	40	4.05	+1.13	6.20	1808	0.60	1854
Indiana.									
Logansport.....	Cass.....	3.36	16	.....	.....	7.17	1890	0.85	1857
Vevay.....	Switzerland.....	3.51	26	2.25	-1.26	7.18	1872	0.92	1889
Iowa.									
Cresco.....	Howard.....	2.14	19	2.38	+0.24	3.68	1888	1.11	1883
Monticello.....	Jones.....	2.56	35	2.00	-0.56	5.78	1862	0.63	1863
Logan.....	Harrison.....	2.69	24	2.10	-0.59	5.44	1888	0.40	1870
Kansas.									
Lawrence.....	Douglas.....	3.20	24	5.79	+2.59	5.79	1891	1.08	1870
Wellington.....	Sumner.....	3.50	12	2.40	-1.10	6.49	1888	0.54	1880
Louisiana.									
Grand Coteau.....	St. Landry.....	5.05	8	0.87	-4.18	10.64	1890	0.87	1891
Maine.									
Orono.....	Penobscot.....	2.91	21	3.26	+0.35	5.08	1887	1.28	1881
Maryland.									
Cumberland.....	Allegany.....	2.40	19	2.02	-0.38	6.50	1874	0.60	1879

## Deviations from average precipitation—Continued.

State and station.	County.	(1) Average for the month of April.	(2) Length of record.	(3) Total for April, 1891.	(4) Departure from average.	(5) Extremes for April.			
						Greatest.		Least.	
						Am't.	Year.	Am't.	Year.
<i>Massachusetts.</i>		<i>Inches</i>	<i>Years</i>	<i>Inches</i>	<i>Inches.</i>	<i>Inches.</i>		<i>Inches</i>	
Amherst .....	Hampshire ..	3.16	55	3.57	+0.41	8.33	1854	0.57	1844
Newburyport ..	Essex .....	3.11	11	2.10	-1.01	4.99	1887	1.78	1890
Somerset .....	Bristol .....	3.87	18	4.01	+0.14	7.72	1874	1.52	1881
<i>Michigan.</i>									
Kalamazoo .....	Kalamazoo ..	2.57	15	2.65	+0.08	8.00	1880	0.92	1876
Thornville .....	Lapeer .....	2.38	14	2.13	-0.25	6.13	1880	1.34	1889
<i>Minnesota.</i>									
Minneapolis .....	Hennepin .....	2.39	23	2.02	-0.37	5.12	1888	0.53	1881
<i>Montana.</i>									
Fort Shaw .....	Lewis & Clarke ..	0.64	20	0.90	+0.26	2.30	1886	0.04	1875
<i>New Hampshire.</i>									
Hanover .....	Grafton .....	2.37	48	2.21	-0.16	6.00	1840	0.38	1872
<i>New Jersey.</i>									
Moorestown .....	Burlington ..	2.91	27	2.32	-0.59	8.40	1874	0.67	1881
South Orange .....	Essex .....	3.18	20	3.80	+0.62	7.54	1889	0.85	1881
<i>New York.</i>									
Cooperstown .....	Otsego .....	2.94	37	2.22	-0.72	7.12	1854	0.92	1863
Palermo .....	Oswego .....	2.36	37	1.73	-0.63	7.00	1859	0.26	1879
<i>North Carolina.</i>									
Lenoir .....	Caldwell .....	3.61	19	3.20	-0.41	7.80	1874	1.30	76, '85
<i>Ohio.</i>									
N. Lewisburgh ..	Champaign ..	2.76	19	3.75	+0.99	6.45	1880	0.63	1879
Wauseon .....	Fulton .....	2.57	18	4.39	+1.82	5.29	1890	1.31	1872
<i>Oregon.</i>									
Albany .....	Linn .....	3.38	14	3.37	-0.01	6.53	1883	1.38	1885
Eola .....	Polk .....	2.65	20	3.71	+1.06	6.50	1883	0.89	1888
<i>Pennsylvania.</i>									
Dyberry .....	Wayne .....	2.48	22	2.42	-0.06	5.07	1874	0.80	1882
Grampian Hills ..	Clearfield .....	3.49	20	2.34	-1.15	6.11	1874	1.35	1870
Wellsborough .....	Tioga .....	4.99	12	1.07	-3.92	10.77	1856	1.07	1891
<i>South Carolina.</i>									
Statesburgh .....	Sumter .....	2.41	10	1.21	-1.20	4.17	1883	0.83	1888
<i>Tennessee.</i>									
Austin .....	Wilson .....	4.85	23	2.59	-2.26	11.98	1877	1.79	1876
<i>Texas.</i>									
New Ulm .....	Austin .....	3.95	18	4.57	+0.62	8.00	1873	0.17	1887
<i>Vermont.</i>									
Stratford .....	Orange .....	2.75	18	2.40	-0.35	12.20	1874	0.60	73, '81
<i>Virginia.</i>									
Birdsneat .....	Northampton ..	3.63	22	2.95	-0.68	11.25	1889	1.10	1869
<i>Washington.</i>									
Fort Townsend ..	Jefferson .....	1.53	15	2.42	+0.89	2.98	1883	0.38	1877
<i>Wisconsin.</i>									
Madison .....	Dane .....	4.52	22	1.55	-2.97	5.49	1861	0.96	1887

## EXCESSIVE PRECIPITATION.

Monthly precipitation to equal or exceed 10.00 was reported at 2 stations in Texas, and at 1 station in Wash., Oregon, and Cal.; the heaviest rainfall, 13.84, being reported at Gallinas, Tex.

In the last 21 years precipitation to equal or exceed 10.00 has been reported for April for 10 years in La. and Miss.; for 8 years in Ark. and N. C.; for 7 years in Ala.; for 6 years in Tenn.; for 5 years in Tex.; for 4 years in Ga.; for 3 years in Ind., Kans., and Va.; for 2 years in Fla., Ill., Md., N. H., N. J., Ohio, and S. C.; and for 1 year in Colo., Conn., Ind. T., Ky., Mass., Mich., Mo., Nebr., N. Y., Pa., Vt., and Wis.

Precipitation to exceed 20.00 in April was reported in Ark. in 1886, in Cal. in 1880, in Miss. in 1871 and 1874, and at Mount Washington, N. H., in 1878. Precipitation to exceed 15.00 in April was reported for 3 years in Tex., La., and Ark.; for 2 years in Ala.; and for 1 year in Cal., Ga., Miss., N. Y., N. C., S. C., and Tenn.

Precipitation to equal or exceed 2.50 in 24 hours was reported for 14 stations in Tex., and on 9 dates, the 11th to 13th and 17th to 22d; at 7 stations in Nebr., and on 4 dates, the 14th to 16th and 19th; at 5 stations in Miss., and on 2 dates, the 10th and 13th; at 4 stations in Mo., and on 3 dates, the 8th, 9th, and 14th; at 3 stations in Kans., and on 4 dates, the 1st, 13th, and 16-17th; at 2 stations in N. C., and on 2 dates, the 10th and 11th; at 2 stations in Fla., and on 3 dates, the 26th, 27th, and 29th; at 2 stations in Okla. T., and on 2 dates, the 18th and 19th; at 2 stations in Oregon, on the 22d; at 2 stations in Cal., and on 2 dates, the 7th and 10th; at 2 stations in La., and on 3 dates, the 10th, and 22-23d; at 1 station in Mass., on the 3d; at 1 station in New Mexico, on the 27th; and at 1 station in Wis., on the 20th. Among the heavier rainfalls reported for this period are: 8.12, at Gallinas, Tex., 20th-21st; 7.50, at Austin, Mo., 8-9th; and 4.93, at Fort McIntosh, Tex., on the 19th.

In the last 21 years precipitation to equal or exceed 2.50 in 24 hours in April has been reported for 13 years in Ala., Ark., Ga., La., Tenn., and Tex.; for 11 years in Miss. and N. C.; for 9 years in Kans. and Fla.; for 8 years in the Dakotas and Ill.; for 7 years in Ind.; for 6 years in Ind. T.; for 5 years in Iowa and Ky.; for 4 years in Md., Mo., Nebr., S. C., and Va.; for 3 years in Conn., N. Y., and Pa.; for 2 years in Cal., Colo., Minn., and Vt.; and for 1 year in Fla., Me., Mass., Mich., Mont., N. J., Ohio, R. I., Wis., and Wyo. Among the heavier 24-hour rainfalls reported for this period are: 12.28, at Point Pleasant, La., 5th, 1885; 11.00, at Fort Smith, Ark., 23d, 1879; and 7.30, at Mobile, Ala., 19th, 1882. Precipitation to exceed 5.00 in 24 hours has been reported for 4 years in Tex.; for 3 years in La.; for 2 years in Ala., Ark., and Kans.; and for 1 year in Cal., D. C., Ga., Ill., Ind., Md., Pa., S. C., and Va.

Precipitation to equal or exceed 1.00 in 1 hour was reported at 6 stations in Tex., and on 6 dates, the 1st, 9th, 11th, 12th, 17th, and 21st; at 2 stations in Kans., and on 2 dates, the 16th and 17th; at 2 stations in Miss. on the 10th; at 1 station in Ill. on the 9th; at 1 station in Ohio on the 9th; at 1 station in New Mexico on the 27th; and at 1 station in N. C. on the 11th. At Gallinas, Tex., 5.40, fell in 5 hours on the 21st, and 5.20 in 2 hours and 15 minutes on the 17th. At York, Pa., 0.25 fell in 9 minutes on the 11th; at Memphis, Tenn., 0.35, in 5 minutes, on the 15th; at Philadelphia, Pa., 0.45, in 5 minutes, on the 16th; and at Corpus Christi, Tex., 0.52 fell in 13 minutes, on the 20th. Excessive rainfall for 5 and 10 minute periods at regular stations of the Signal Service is given in the table of "Maximum rainfall in 1 hour or less."

In the last 21 years precipitation to equal or exceed 1.00 in 1 hour has been reported for 9 years in Tex.; for 5 years in Fla.; for 4 years in Ark. and Tenn.; for 3 years in Ga., Ill., Iowa, and Kans.; for 2 years in Ala., La., Miss., N. C., Pa., and S. C.; and for 1 year in the Dakotas, Md., Mich., Mo., Nebr., and N. J. Among the heavier rainfalls reported for this period are: 1.12 in 12 minutes at Atlanta, Ga., 24th, 1889; 1.39 in 15 minutes at Egg Harbor City, N. J., 27th, 1890; 1.50 in 20 minutes at Jacksonville, Fla., 23d, 1883; and 1.50 in 10 minutes, at Adrian, Mich., 5th, 1888.

Table of excessive precipitation, April, 1891.

State and station.	Monthly rainfall to inches or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch or more, in one hour.		
		Am't.	Day.	Am't.	Time.	Day.
<i>California.</i>	<i>Inches.</i>	<i>Inches.</i>		<i>Inches.</i>	<i>h. m.</i>	
Upper Mattole .....	11.22	2.80	7	.....	.....	.....
Do. ....	.....	4.54	10	.....	.....	.....
<i>Florida.</i>						
Merritt's Island .....	.....	3.77	27	.....	.....	.....
Orange City .....	.....	3.74	26, 27	.....	.....	.....
<i>Illinois.</i>						
Lacon .....	.....	.....	.....	1.00	0 45	9
<i>Kansas.</i>						
Columbus .....	.....	3.01	16, 17	.....	.....	.....
Dodge City .....	.....	.....	.....	1.00	0 55	16
Oberlin .....	.....	2.50	1	.....	.....	.....
Rome .....	.....	.....	.....	1.27	1 00	17
Seneca .....	.....	2.80	13	.....	.....	.....
<i>Louisiana.</i>						
Alexandria .....	.....	3.40	22, 23	.....	.....	.....
Marksville .....	.....	2.50	10	.....	.....	.....
<i>Massachusetts.</i>						
Northampton .....	.....	3.05	3	.....	.....	.....
<i>Mississippi.</i>						
Brookhaven .....	.....	2.58	10	.....	.....	.....
Fayette .....	.....	3.27	10	3.27	2 00	10
Kosciusko .....	.....	2.50	13	.....	.....	.....
Logtown .....	.....	4.00	10	4.00	3 00	10
Water Valley .....	.....	2.83	10	.....	.....	.....
<i>Missouri.</i>						
Austin .....	.....	7.50	8, 9	.....	.....	.....
Eight Mile .....	.....	2.75	8, 9	.....	.....	.....
Harrisonville .....	.....	2.60	8, 9	.....	.....	.....
Saint Joseph .....	.....	2.73	14	.....	.....	.....
<i>Nebraska.</i>						
Ansley .....	.....	3.00	14	.....	.....	.....
Burwell .....	.....	3.28	16	.....	.....	.....
North Loup .....	.....	2.64	15	.....	.....	.....
Oakdale .....	.....	3.81	19	.....	.....	.....
O'Neill .....	.....	3.00	15, 16	.....	.....	.....
Ravenna .....	.....	2.65	15, 16	.....	.....	.....

Table of excessive precipitation—Continued.

State and station.	Monthly rainfall to inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
<i>Nebraska—Continued.</i>						
Wallace .....	<i>Inches.</i>	<i>Inches.</i>		<i>Inches</i>	<i>h. m.</i>	
<i>New Mexico.</i>		4.43	19			
Los Lunas .....				2.40	2.15	27
<i>North Carolina.</i>						
Mount Airy .....		2.79	10			
Littleton .....		2.70	11	1.37	1.00	11
<i>Ohio.</i>						
West Milton .....				1.30	1.00	9
<i>Oklahoma Territory.</i>						
Fort Sill .....		3.25	18, 19			
Oklahoma City .....		2.96	19			
<i>Oregon.</i>						
Bandon .....	11.35	2.56	22			
Gardiner .....		2.50	22			
<i>Texas.</i>						
Austin (1) .....		4.80	19, 20			
Austin (3) .....		4.17	19, 20			
Brownsville .....				1.30	1.00	1
Burnet .....		3.54	19, 20			
Childress .....				1.00	1.00	17
College Station .....				1.95	1.00	9
Corsicana (1) .....		2.94	19, 20			
Corsicana (2) .....		2.65	12, 13			
Do .....		3.42	19, 20			
Duval .....		3.10	20			
Fort McIntosh .....		4.93	19			
Gallinas .....	13.84	5.20	17	5.20	2.15	17
Do .....		8.12	20, 21	5.40	5.00	21
Huntsville .....	13.74	4.00	18			
Do .....		3.00	22			
Lozier .....		3.50	11	3.50	1.00	11
Luckenbach .....		2.50	19, 20			
New Braunfels .....		3.91	19, 20			
Palestine .....		3.33	17, 18	1.36	1.00	12
Victoria .....		2.80	20			
Waco (2) .....		2.70	13			
Do .....		3.90	19, 20			
Wichita Falls .....		3.40	18, 19			
<i>Washington.</i>						
Neah Bay .....	11.84					
<i>Wisconsin.</i>						
Weston .....		2.50	20			

## MAXIMUM RAINFALL IN ONE HOUR OR LESS.

The following table is a record of the heaviest rainfall during April, 1891, for periods of five and ten minutes and one hour, as reported by regular stations of the Signal Service furnished with self-registering gauges:

Station.	Maximum fall in—					
	5 min.	Date.	10 min.	Date.	1 hour.	Date.
	Inch.		Inch.		Inch.	
Bismarck, N. Dak.	0.05	15	0.09	15	0.25	15
Boston, Mass.	0.02	10	0.03	10	0.15	10
Buffalo, N. Y.	0.05	9	0.10	9	0.25	9
Cincinnati, Ohio	0.15	17	0.17	17	0.35	9
Chicago, Ill.	0.06	30	0.11	30	0.20	30
Cleveland, Ohio	0.03	18	0.05	18	0.10	18
Denver, Colo.	0.19	14	0.26	14	0.42	14
Detroit, Mich.	0.25	15	0.45	15	1.00	15
Dodge City, Kans.	0.06	27	0.08	27	0.18	27
Duluth, Minn.					0.06	15
Eastport, Me.	0.15	22	0.20	22	0.38	22
Galveston, Tex.	0.10	18	0.20	18	0.40	18
Jupiter, Fla.	0.20	13, 18	0.25	13, 18	0.40	13
Kansas City, Mo.	0.04	24	0.07	24	0.19	24
Key West, Fla.						
Marquette, Mich.	0.35	15	0.55	15	0.80	15
Memphis, Tenn.	0.02	2	0.03	2	0.17	2
New York City	0.05	21	0.06	21	0.09	21
New Orleans, La.	0.20	12	0.25	12	0.47	12
Norfolk, Va.	0.45	16	0.67	16	0.85	16
Philadelphia, Pa.	0.25	16	0.50	16	0.60	16
Philadelphia Water Works	0.03	7	0.05	7	0.15	7, 22
Portland, Oregon	0.13	16	0.22	16	0.46	16
Saint Louis, Mo.	0.04	21	0.08	21	0.10	20
Saint Paul, Minn.						
San Diego, Cal.						
San Francisco, Cal.	0.15	2, 23	0.25	23	0.55	23
Savannah, Ga.	0.23	11	0.36	11	0.77	11
Washington City	0.05	11	0.08	11	0.25	11
Wilmington, N. C.						

\* Not sufficient to register. † Register not working. ‡ No record on account of snow.

## SNOW (in inches and tenths).

Chart IV shows the depth of snowfall reported for the month. The heaviest monthly snowfall reported was 46.0, at Summit, Cal. Snowfall to exceed 20.0 was reported in the mountains

of central Colorado, and at stations in Vermont and New Hampshire. In central and west-central Nevada, central and north-central Wyoming, generally in central and southwest Colorado, in north-central upper Michigan, in New England, except along the coast, in northeast and southeast New York, and at points in the Alleghany Mountains from extreme west Virginia northward the monthly snowfall was more than 10.0. Trace of snowfall was reported north of a line traced from the New Jersey coast southwestward to east-central Alabama, thence northwest to southern Illinois, thence westward to southern Kansas, thence southwestward to southern New Mexico, thence north of west to east California in about latitude north 37°, thence west of north over east California, and thence irregularly northeast to west Montana. 4.0 was reported at Tehachapi and 3.0 at Julian, Cal., and 3.5 at Happy Valley, Oregon. No snow was reported on the ground at the close of the month.

Snowfall of five inches, or more, was reported as follows, and in states and territories where the maximum depth was less than that amount, the station reporting the greatest is given: *Alabama*.—Auburn and Valley Head, trace. *Arizona*.—Chloride, 0.5. *California*.—Summit, 46; Cisco, 37; Emigrant Gap, 28; Truckee (1), 20.5; Boca, 17. *Colorado*.—Georgetown, 22.5; Climax, 19.5; Leadville, 19.2; Moraine and Rico, 18; Breckenridge, 17; Fort Lewis, 15.8; Como (near) and Husted, 13; Fort Logan and Smoky Hill Mine, 12; Stamford, 11.5; Dillon and Saint Cloud, 11; Elkhorn, 10.5; Denver, 9.2; Box Elder and Sheridan Lake, 9; Canon City, Cumbres, Red Cliff, and Stunner, 8; Del Norte and Pagoda (near), 7.5; Dumont, 6.3; Castle Rock, Cheyenne Wells, Deer Trail, and Yuma, 6; Jefferson, 5.6; San Luis, 5.4; Alma, Greenhorn, and Thon, 5. *Connecticut*.—New Hartford (2), 18; Canton, 16; Falls Village, 15; New Hartford (1) and Waterbury, 11; West Simsbury, 10; Newington, 7; Hartford (2), Mansfield, and Southington, 6. *Georgia*.—Atlanta, 0.8. *Illinois*.—Aurora (2), 4. *Indiana*.—Indianapolis, 3.8. *Iowa*.—Bedford, 2.5. *Kansas*.—Gove City and Tribune, 8. *Kentucky*.—Harrodsburg, 7. *Maine*.—Farmington, Kent's Hill, and Mayfield, 12; Orono, 11; Calais, 10; Kennebec Arsenal, 9; Belfast and Lewiston, 8; Fairfield, 6. *Maryland*.—Cumberland (2), 0.5. *Massachusetts*.—Royalston, 19.4; Florida, 17; Fitchburgh (1 and 2), 13; Groton (1), 12; Amherst (1 and 2), 11; Fiskdale and Leominster, 10; Leicester, 9.2; Gilbertville, 9; Ludlow (1 and 2) and Springfield Armory, 8; Westborough, 7; North Billerica, 6; Dudley, 5. *Michigan*.—Marquette, 12. *Minnesota*.—Fort Ripley, 9; Pine River, 7; Minneapolis and Farmington, 6. *Mississippi*.—Pontotoc, trace. *Missouri*.—Dadeville, 2. *Montana*.—Virginia City, 12.

*Nebraska*.—Hay Springs, 3.5. *Nevada*.—Palmetto, 20.5; Eureka, 17.2; Austin, 15.8; Candelaria, 12; Ely, 11; Crane's Ranch, 9; Carson City, 8.4; Genoa, 8.2; Lewer's Ranch, 6; Pioche, 5.7. *New Hampshire*.—Walpole, 20; Berlin Mills, 16; Antrim, 15; Wolfborough, 14.4; West Milan, 13; Hanover (1 and 2), 11; Concord, 10; Lake Village, 8.8; Belmont, 8.4; Littleton, 8; Stratford, 7; Manchester, 6.7; Nashua and Plymouth, 6. *New Jersey*.—Deckertown, 5.8; Newton, 5. *New Mexico*.—Embudo and Fort Wingate, 2. *New York*.—Honey-mead Brook, 18.6; Malone, 17; Boyd's Corners, 13; Carmel, 12; Humphrey, 9.5; West Point, 9; Rondout, 8.5; White Plains, 7; Plattsburgh, 6.7; Number Four, 6.2; Plattsburgh Barracks, 6.1; Quaker Street, 6; Factoryville, 5.7; Brookfield, 5.5; South Canisteo, 5.4; Cooperstown and Turin, 5.2; Middleburgh, Port Jervis, and Watervliet Arsenal, 5. *North Carolina*.—Bakersville, 6. *North Dakota*.—Fort Yates, 6.5; Bismarck, 5.1. *Ohio*.—Bement, 4. *Oregon*.—Siskiyou, 6.5. *Pennsylvania*.—Blue Knob, 16.5; Salem Corners, 16; Dyberry, 10; Pleasant Mount, 9.8; Eagle's Mere, 5.5; Le Roy, 5. *Rhode Island*.—Bristol, Kingston (1), Providence (1 and 2), trace. *South Dakota*.—Spearfish, 13.5. *Tennessee*.—Northville, 2. *Utah*.—Beaver, 10; Park City, 7.5; Parowan, 6. *Vermont*.—Jacksonville, 23; Vernon and Weathersfield Centre, 18; Northfield, 15.5; Chelsea and East Berkshire, 15; Strafford, 14; Burling-

ton, 10.5; Cornwall and Hartland, 10. *Virginia*.—Marion, 12; Abingdon, 9; Big Stone Gap, 5. *West Virginia*.—Tyler Creek, 3. *Wisconsin*.—Butternut, 8; Bayfield, 6.5; Medford (1), 6; Hayward, 5.5; Ithaca and Phillips, 5. *Wyoming*.—Fort Washakie, 24.1; Fort McKinney, 12; Cheyenne, 6.8.

The following is the heaviest snowfall reported for April in the several states and territories from 1882 to 1890, inclusive: Ariz., 14.0, at Cooley's Springs, in 1890; Cal., 126, at Summit, in 1884; Colo., 61.2, at Pike's Peak, in 1886; Conn., 14.0, at North Colebrook, in 1887; Ill., 10.5, at Riley, in 1884; Ind., 17.5, at Farmland, in 1886; Iowa, 5.5, at Manchester, in 1884; Kans., 18.0, at Fort Scott, in 1884; Ky., 5.8, at Frankfort, in 1886; Me., 21.0, at Cornish, in 1888; Md., 10.0, at Cumberland, in 1889; Mass., 26.0, at Princeton, in 1884; Mich., 39.3, at Hudson, in 1885; Minn., 18.2, at Saint Vincent, in 1885; Mo., 6.5, at Saint Louis, in 1886; Mont., 18.4, at Fort Maginnis, in 1887; Nebr., 14.8, at North Platte, in 1886; Nev., 26.0, at Ruby Hill, in 1890; N. H., 66.0, at Mount Washington, in 1882; N. J., 7.0, at Vineland, in 1887; N. Mex., 5.8, at Santa Fe, in 1885; N. Y., 19.5, at Rochester, in 1885; N. C., 17.0, at Raleigh, in 1887; Ohio, 22.0, at Jacksonborough, in 1886; Oregon, 7.5, at Vernonia, in 1890; Pa., 23.9, at Drifton, in 1884; R. I., 13.2, at Block Island, in 1887; Dakota, 45.1, at Deadwood, in 1887; Tex., 3.0, at Ochiltree, in 1890; Utah, 13.6, at Nephi, in 1883; Vt., 29.0, at Strafford, in 1887; Va., 11.5, at Alum Springs, in 1889; W. Va., 10.5, at Helvetia, in 1885; Wis., 18.5, at Wausau, in 1885; and Wyo., 22.0, at Cheyenne, in 1890.

#### ○ HAIL.

Description of the more severe hail storms of the month is

given under "Local Storms." Hail was reported as follows: 1st, Ind., Ky., Minn., Miss., Mo. 2d, Ill., Minn., N. C., Wash. 3d, Ind., Mo., Ohio, Tenn. 4th, N. J., Va. 6th, Cal., Colo., Mo., Ohio. 7th, Cal., Nev., Oregon. 8th, Cal., Iowa, Kans., Minn., Mo., S. Dak., Tex., Wis. 9th, Ark., Ill., Ind., Iowa, Kans., Mich., Minn., Mo., Tenn., Tex. 10th, Ind., Ky., Mich., Miss., Ohio. 11th, Nev., N. C., Pa., Tenn., Tex. 12th, Iowa, Kans., Nebr., Okla. T., S. Dak., Tex. 13th, Iowa, Kans., Mo., Nebr., Nev. 14th, Mich., Ohio, Okla. T., Tex., Utah. 15th, Colo., Fla., Kans., Mo., Nebr., S. C., Tex., Utah, Wyo. 16th, Ariz., Ark., Colo., Ill., Iowa, Kans., Minn., Mo., Nebr., N. C., Pa., S. Dak., Tex., Utah, Wyo. 17th, Ill., Ind., Iowa, Kans., Mo., Nev., Ohio, Tenn., Tex., Va. 18th, Colo., Ind., Iowa, Nev., N. H., Pa., Tenn., Tex. 19th, Colo., Kans., Nev., S. Dak., Tenn., Tex. 20th, Colo., Iowa, Kans., Mont., Tenn., Tex., Wyo. 21st, Colo., Ill., Ind., Nebr., S. Dak., Tenn., Tex. 22d, Ark., Colo., Ill., Iowa, Ky., Mo., Ohio, Okla. T., Pa., Tenn., Tex., Wash. 23d, Cal., Miss., N. C., Oregon, Pa., Wash. 24th, Ga., Idaho, Oregon, S. C. 25th, Mass., N. J., Pa. 27th, N. Mex. 28th, Nebr., N. C., Wash. 29th, Idaho, Kans., Mont., Nebr., N. H., Wash. 30th, Ind., Ohio, Pa., S. Dak., Tex.

#### ○ SLEET.

Sleet was reported as follows: 1st, Kans. 2d, Iowa, Wis. 3d, Ill., Me., Mass., Mo., Mont., N. Y., Pa., Tenn. 4th, Ind., Tenn. 5th, Tenn. 6th, Colo., Md. 7th, Cal., Nev., Utah. 8th, Iowa, Minn., Mo., Nebr., S. Dak., Wis. 9th, Mich., Minn. 10th, Minn. 12th, Pa. 14th, Mich. 16th, Utah. 18th, Ariz., Utah. 23d, Me. 24th, Cal. 25th, Cal., Me., Mass., Wyo.

#### ○ WINDS.

The prevailing winds during April, 1891, are shown on Chart II by arrows flying with the wind. In New England, the middle Atlantic states, the lower lake region, the upper Mississippi valley, on the middle-eastern slope of the Rocky Mountains, over the southern and northern plateau regions, and on the middle Pacific coast the winds were mostly from southwest to northwest; in the south Atlantic states, on the northeast slope of the Rocky Mountains, over the middle plateau region, and on the north Pacific coast from southeast to southwest; over the Florida Peninsula, from northeast to southeast; in the west Gulf states and the Rio Grande Valley, from east to southeast; in the Ohio Valley and Tennessee, from west to north; in the upper lake region, from northwest to northeast; in the extreme northwest, from northwest to north; in the Missouri Valley, from the northwest; on the southeast slope of the Rocky Mountains, from the south; on the south Pacific coast, from the west; and in the east Gulf states, variable.

#### ○ HIGH WINDS.

[In miles per hour.]

Wind velocities of 50 miles, or more, per hour were reported at regular stations of the Signal Service, as follows: 1st, 50, n., at Oklahoma City, Okla. T.; 60, w., at Fort Sill., Okla. T. 2d, 54, se., at Wood's Holl, Mass. 3d, 60, e., at Eastport, Me.; 60, ne., at Boston, Mass.; 52, se., at Nantucket, Mass.; 54, w., at Wood's Holl, Mass.; 70, se., at Block Island, R. I. 5th, 68, se., at Fort Canby, Wash. 8th, 54, nw., at Cheyenne, Wyo. 12th, 52, s., at Sioux City, Iowa. 16th, 53, s., at Sioux City, Iowa; 58, sw., at Dodge City, Kans. 20th, 63, nw., at Corpus Christi, Tex.; 50, se., at Chicago, Ill. 21st, 59, se., at Fort Canby, Wash. 22d, 40, sw., at Block Island, R. I.; 68, se., at Fort Canby, Wash. 25th, 50, sw., at Fort Du Chesne, Utah. 26th, 67, se., at Fort Canby, Wash.; 50, ne., at Kitty Hawk, N. C. 27th, 51, sw., at Port Huron, Mich. 29th, 54, n., at Fort Custer, Mont.

#### ○ LOCAL STORMS.

1st.—At Oklahoma City, Okla. T., a severe gale began

about 5 p. m., causing damage to buildings, etc. At Guthrie, Okla. T., a heavy wind storm prevailed from 4 to 6 p. m., during which 1 building was blown down.

2-3d.—A severe gale prevailed along the New England and New Jersey coasts, causing damage to shipping and sea-side property. At Block Island, R. I., the wind attained a velocity of 70 miles per hour at 1.52 a. m., 3d; there was a heavy sea, and all vessels remained in port. At New Haven, Conn., snow began at 6.30 p. m., 2d, and ended at 10.45 a. m., 3d, with heavy wind shifting from ne. to nw. At New London, Conn., snow continued at intervals during the day and night of the 2d, with high ne. shifting to nw. winds. The wind on Long Island Sound was high, and the New York and Stonington boats were delayed several hours. At Boston, Mass., the wind blew with great force from 2 to 7 a. m., 3d, with a maximum of 60 miles per hour from the ne., and gusts of much greater force. From 8 p. m., 2d, to 8 a. m., 3d, the barometer fell 1.00 inch. Considerable damage was done in the city and vicinity. A report from Vineyard Haven, Mass., states that a schooner went ashore at West Chop; no lives lost. At Manchester, N. H., snow commenced the night of the 2d and continued throughout the 3d, with rain at intervals; total snowfall 6.5 inches. The storm was attended with high ne. winds and was the most severe in that section since March, 1888; fruit and shade trees were badly injured and telegraphic communication was cut off for the day. At Portland, Me., a violent ne. gale set in about 5 a. m., 3d, with heavy, moist snow at intervals until 1 p. m.; electric wires were prostrated, and at 4 p. m. the barometer was 29.01 (reduced). At Eastport, Me., a gale began at 4.35 a. m., 3d, and reached a maximum velocity of 60 miles per hour from the se. at 3.05 p. m., and ended at 5.55 p. m. On the 3d, during a heavy nw. sea and snow storm at Cleveland, Ohio, the tug "Tempest" was sunk inside the breakwater, and 3 men were drowned.

8th.—At 9.25 p. m., central time, a storm moved ne. over Garza, Tex., in a path about 50 yards in width. The storm was attended by heavy hail, continuous lightning, and very